Elveden Farms Ltd

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Introduction to Elveden

- Elveden is a 22,500 acre estate on the Suffolk-Norfolk border
- The estate has diversified extensively and now comprises:
  - Farming
  - Produce marketing
  - Forestry and hedging
  - Food production
  - Leisure and retail
Introduction to Elveden Estate
Farming

- Elveden’s farmland extends to over 4,900ha.

- The main crops are:
  - Onions – 40,000 tonnes
  - Potatoes – 28,000 tonnes
  - Carrots – 25,000 tonnes
  - Parsnips – 10,000 tonnes
  - Cereals; rye, wheat and barley – 12,000 tonnes

- Selling to supermarkets and manufacturers nationwide, for leading product brands, including French fries, potato crisps own brand baby potatoes and rye crisp bread.
• Established September 2009
• Joint venture with Elveden Estate
• Annual Turnover £15m
• Brand launched Nov 2009
• Annual branded sales £6m
Onion Marketing

- Our in-house team “Elveden Produce” markets our onions as well as other growers in East Anglia
  Main supply is to supermarkets such as Morrisons, Sainsbury, Asda and Tesco
- Sales of 34,000 tons of English onions per annum
- 3,000 tons of imported onions from Egypt, Chile and Spain
Technology and Innovation
What does it mean?

• Technology
  – The application of scientific knowledge for practical purposes, especially in industry.
  – Machinery and devices developed from scientific knowledge.
  – The branch of knowledge dealing with engineering or applied sciences.

• Innovation
  – A new method, idea or product.
IFM its in our DNA

- Organic Manure
- Cover Crops
- Monitoring
- Timing
- Machine outputs
- Irrigation scheduling
- Team Skills
- Organic Manures
- Cover Crops
- Pollinators Predators
- Pumps and Fans
- Fuel Efficiency
- Imagery
- Pest Control
- Carbon Foot printing
- Run off
- Energy Efficiency
- Animal Husbandry
- Pollution Control & By-product Management
- Water Management
- Community Engagement
- Organisation & Planning
- Soil Management & Fertility
- Landscape & Nature Conservation
- Integrated Farm Management
- LEAF
Soil Management and Fertility

- Companion crops
IFM at Elveden

• Organic manure trial site
• Started in 1999 as a response to fears over a Phosphate ‘tax’
• Compares non manure and rotational manuring
• Annual manuring area introduced in 2010
• Mimics commercial practice so organic manure type has changed over time
Organic manure learnings

- A better understanding of how high and lower solubility elements behave in our soils
- Longevity of organic manure additions
- Does higher OM% give us more resilience to leaching events
- What glass ceilings do we have in our production system
- Could we mimic the results using cheaper cover crops? BUT!
Trial aims

• Assess any benefits to moisture and soluble nutrient retention with an over winter cover crop.
• Assess impacts on cultivation and crop performance from different cover crops.
• Assess impacts on cultivation and crop performance from different seed bed preparation techniques.
• What happens if we lose glyphosate.
• What happens if we are ‘encouraged’ to have over winter ground cover.
Cover Crop Pictures

- Black Oat
- Crimson Clover
- Forage Radish
- Phacelia Plus Crimson Clover
- Forage Rye
- Vetch
Soil preparation for onions
## Operational findings

<table>
<thead>
<tr>
<th>Difference/ha over SFP for destoning</th>
<th>Work Rate/Hr</th>
<th>Diesel per Ha</th>
<th>Diesel per Ha</th>
<th>Kg CO2 equivalent / ha</th>
<th>Energy/MJ/Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addition of Cover Crop</td>
<td>60% Reduction</td>
<td>86lt increase</td>
<td>245% increase</td>
<td>231kg increase</td>
<td>3,260 MJ increase</td>
</tr>
<tr>
<td>£ implications/ha</td>
<td>£147 increase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 800 Ha</td>
<td>£117,600</td>
<td></td>
<td></td>
<td>185t</td>
<td>2,608,000</td>
</tr>
<tr>
<td>Difference/ha over SFP for bed tillering</td>
<td>Work Rate/Hr</td>
<td>Diesel per Ha</td>
<td>Diesel per Ha</td>
<td>Kg CO2 equivalent / ha</td>
<td>Energy/MJ/Ha</td>
</tr>
<tr>
<td>Addition of Cover Crop</td>
<td>20% Reduction</td>
<td>3lt increase</td>
<td>23% increase</td>
<td>8kg increase</td>
<td>118MJ increase</td>
</tr>
<tr>
<td>£ implications/ha</td>
<td>£28 increase</td>
<td></td>
<td></td>
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<tr>
<td>Over 800 Ha</td>
<td>£22,400</td>
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<td></td>
<td>6.4t</td>
<td>94,400 MJ Increase</td>
</tr>
</tbody>
</table>

- Introducing this cover crop into a destoning system increased Kg CO2 eq, over SFP on the whole crop footprint by 26%
## Net impacts

<table>
<thead>
<tr>
<th>Removal of Destoning, addition of cover crop/ha</th>
<th>Work Rate Ha/Hr</th>
<th>Diesel per Ha</th>
<th>Diesel per Ha</th>
<th>Kg CO2 equivalent</th>
<th>Energy/MJ/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destoning</td>
<td>100% Reduction</td>
<td>59lt decrease</td>
<td>100% decrease</td>
<td>158kg decrease</td>
<td>2,236 MJ decrease</td>
</tr>
<tr>
<td>£ implications/ha</td>
<td>£245 saving</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Over 800ha</td>
<td>£190,000 saving</td>
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<tr>
<td>Bed Tilling</td>
<td>32% Reduction</td>
<td>4.5lt increase</td>
<td>28% increase</td>
<td>12kg increase</td>
<td>170 MJ increase</td>
</tr>
<tr>
<td>£ implications/ha</td>
<td>£45 increase</td>
<td></td>
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<tr>
<td>Over 800 ha</td>
<td>£36,000 increase</td>
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<tr>
<td>Net</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>£ implications/ha</td>
<td>£200 saving</td>
<td></td>
<td></td>
<td>146kg decrease</td>
<td></td>
</tr>
<tr>
<td>Over 800 ha</td>
<td>£160,000 saving</td>
<td></td>
<td></td>
<td>116,800kg decrease</td>
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</tbody>
</table>

- Introducing this cover crop into a changed non-destoning system decreased Kg CO2 eq, over SFP on the whole crop footprint by 15%
SMS Probe
Increase in available water?
Increased nutrient holding capacity?
Conclusions from introducing cover crops

• Appears to be more potato volunteers surviving the non destoned plots (more pesticides use in crop)
• Non destoned plots could have a possible advantage in a dry season, Disadvantage in wet season?
• We had to use glyphosate in the crop pre-emergence to control the volunteer grasses.
• By not destoning to what extent would the soil biology improve?
• Would not destoning negatively impact the storability and saleable quality of the crop (what's the financial impact of this).
• Risk versus potential saving? Cost reduction is only 4% of the gross value of crop.
• To offset the negative impact on the machine output of cover crop it would need to be destroyed in advance of land preparation.
• Could novel harvesting techniques be designed to lift the onions without lifting soil.
Technology Gaps?

- Capture of real time operational data, to assess impact quicker.
- Accurate measurement of any soluble nutrient loss.
- Ability to measure weed numbers and species.
- Ability to measure crop growth stages and biomass.
- Ability to measure yield and final bulb size.
- Ability to measure and quantify soil biology.
- Ability to quantify improved soil organic matter.
- Robot soil aerators.
Water Management
Irrigation

- **Aim:** To meet plant demands for water and nutrition and optimise the water available to us.

- **Quality:** Skin Finish, Shape, Size, Uniformity, Length, Tuber Count

- **Agronomic:** Aid fertiliser uptake, maximise efficacy of soil applied herbicides, activation of soil stabilisers, aid harvesting and reduce damage at harvest

- **Monitoring:** Maximise point application rates through real time monitoring

- **Reduce our Carbon footprint**
Run off trials
Energy Efficiency

- **Diesel trials.** Tractor diesel savings of up to 10%
- **In house design of sub soiler points reducing wear and diesel usage**
- **Soil engaging systems.**
- **Investment in inverter drive fans and pumps**
- **Investment in glycol refrigerant system for onions.** Reduction of 31.5t of CO2/yr
Equivalent CO$_2$

Equivalent Carbon Dioxide Generation Over 10 Years

Annual CO$_2$ and Initial Refrigerant Charge CO$_2$ Equivalent
Landscape and Nature Conservation
Crop Health and Protection

- Do crops behave differently behind different organic manures?
- Stale seed beds
- Pest control
- Vision guidance hoes
- GPS hydraulic drive spreaders with weigh cells
- Band sprayers
- GPS guided sprayers and section control
- Filling in field and using closed transfer pesticide systems
Community Engagement

- LEAF demonstration farm since October 2013

- McDonalds Europe flagship Farm since June 2011

- Host of AHDB Potatoes Spot Farm East 2016-18

- Use of social media

- Membership of local interest groups
The market place  Engagement
The Consumer Engagement
Today’s influencers; Engagement

- Inductions
- Meetings
- Newsletters
- Special interest tours
- Apprentices
Tomorrow’s influencers; Engagement
The future?

- Real time measurement of soil moisture and nutrient status
- Irrigation delivery systems
- Increased water infiltration and efficacy of nutrients
- Understanding the importance of the root/soil interaction zone
- Constant monitoring of plants for pre stress indicators and biochemical growth profiles
- Simple, but fast information transfer from in field machines to central recording and analytical software
- Imagery support to identify plant growth stages, weed species and growth stage, crop diseases of veg crops
- Selective weeding
- Radar, or internal bed imaging
- Better botanical knowledge of plant, pest and predator interactions
- Increased nutritional value of veg
- Virtual allotments
- Smart regulation
Thank You

Twitter: @elvedenfarmer